

## JRC TECHNICAL REPORTS

# Testing the Effect of the Cookie Banners on Behaviour

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2016

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JRC103997

EUR 28287 EN

PDF ISBN 978-92-79-64432-0 ISSN 1831-9424 doi:10.2791/22197

Luxembourg: Publications Office of the European Union, 2016

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How to cite this report: Van Bavel, R. & Rodríguez-Priego, N. (2016). Testing the Effect of Cookie Banners on Behaviour. *JRC Technical Reports*, EUR 28287 EN, doi:10.2791/22197

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## **Acknowledgements**

We are grateful to Jose Vila, Pam Briggs, Ioannis Maghiros, Rebeca Parra, Ignacio Alastrué, Celine Deswarte, Joana Sousa Lourenço and Patricia Farrer. The experiment was conducted by the Laboratory for Research in Experimental Economics (LINEEX), University of Valencia, in the frame of the project *Behavioural Insights on Cybersecurity* (JRC/SVQ/2014/J.3/0039/RC-AMI). The views expressed in this article are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission.

## **Abstract**

We conducted a laboratory experiment (n=602) to test the effect on behaviour of six different cookie banner messages. These messages were based on four behavioural insights: defaults, information deficit model, protection motivation theory (PMT) and social norms. A control condition presented the traditional cookie banner message as recommended by the European Commission (EC). The behavioural measures were (a) the decision to accept cookies, (b) the decision to click on a link for more information about a website's cookie policy and (c) the time spent reading cookie policy pages. A default banner, which told participants that continuing to browse implied cookie acceptance, led to significantly higher cookie acceptance rates. Participants exposed to a message that included a combination of elements from PMT were less willing to click on a link for more information.

# 1 Introduction

Cookies are small files sent by a website and stored in a user's computer. They are designed to store a small amount of information about a user, such as passwords and preferences, which is relayed back to the website. This information allows the website to offer a better browsing experience. For example, users do not need to login every time they visit the website, and they also receive more personalised services.

However, while cookies by themselves do not contain viruses and malware, the fact that they hold personal information (such as credit card details) means they pose a security threat. Also, the information collected in cookies could be passed on to third parties, who could use it to send tailored advertising or track users' movements on the internet.

The EU Privacy Directive<sup>1</sup> requires internet service providers to seek consent before using cookies. This is generally done with a *cookie banner* which appears when a user first visits a website. A 'Cookie Consent Kit' is even available from the European Commission (EC) to facilitate the inclusion of such a banner<sup>2</sup>. However, this banner has been the focus of debate. Some detractors claim it is an unnecessary burden, while others suggest it makes no difference to users' behaviour.

But what does the evidence say?

This study tested the effect of cookie banners on behaviour, following the trend of applying behavioural insights to policy-making (Executive Order No. 13707<sup>3</sup>, 2015; Lourenço et al., 2016). It examined whether different messages in cookie banners made a difference to (a) the decision to accept cookies, (b) the decision to click on a link for more information about a website's cookie policy and (c) the time spent reading cookie policy pages.

The chosen method was a laboratory experiment with a questionnaire, conducted in Valencia, Spain. This allowed the study to measure cookie acceptance directly and not through proxies such as intention or self-reported behaviour. The gap between such proxies and actual behaviour has been a major concern in online privacy and security behaviour studies (Crossler et al., 2013).

Participants were asked to perform a mock e-commerce exercise. They were randomly assigned to one of six treatment groups, each presented with a different cookie banner message. Some were also assigned to the control group, and presented with the traditional EC banner (i.e. the one provided in the 'Cookie Consent Kit').

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<sup>1</sup> <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32002L0058:EN:HTML>

<sup>2</sup> [http://ec.europa.eu/ipg/basics/legal/cookies/index\\_en.htm#section\\_4](http://ec.europa.eu/ipg/basics/legal/cookies/index_en.htm#section_4)

<sup>3</sup> This Executive Order, signed by President Obama, directs US federal agencies to increase the effectiveness of their programmes by leveraging behavioural science insights.

## 2 The insights behind the messages

This experiment was preceded by two other studies applying behavioural insights to cybersecurity (Rodríguez-Priego & van Bavel, 2016; van Bavel & Rodríguez-Priego, 2016). Building on the experience of these two studies and on the literature in behavioural economics (Marteau et al., 1998; Sunstein, 2014) and cybersecurity (Crossler et al., 2014; Coventry et al., 2016), we arrived at four behavioural insights to guide the design of the experiment. These were: defaults, information deficit model, protection motivation theory (PMT) and social norms.

### 2.1 Defaults

Defaults are probably the single most powerful way to steer people's behaviour in a particular direction while preserving their liberty to make a choice (in other words, to *nudge* them; Sunstein, 2014). A typical example of defaults as nudges are automatic enrolment programmes, where people are included unless they actively make the choice to get out. As an example, defaults were used to get people to use green energy in the US. The increase in uptake was ten-fold, from 7 to 70%. No other nudge could have possibly achieved that amount of change (Sunstein, 2016).

However, defaults can also be used by industry in the design of their websites – and this is occurring with cookie banners. Some internet service providers across Europe are adopting a cookie banner that does not require a click to accept cookies. Rather, they are saying words to the effect that by continuing browsing, the user is accepting cookies. In other words, the default setting is to accept cookies. To reject cookies, users would have to go into their browser settings and deactivate them. People should be more likely to accept cookies with this kind of message than with a *traditional EC* banner message. To confirm this, this study included a default banner like the ones used by some Internet providers (see Figure 4).

### 2.2 Information deficit model

The premise behind the information deficit model is that providing new knowledge produces new behaviour (Marteau et al. 1998). People's behaviour with regard to cookies, therefore, can be changed with new knowledge about cookies. In particular, people may be accepting cookies because they simply do not know that they can continue browsing after they reject them. Providing information to correct this false perception, therefore, could change the rate of acceptance of cookies. To test this hypothesis, the study included a cookie banner message telling users they could continue browsing without accepting cookies (*awareness of choice* banner, see below).

### 2.3 Protection motivation theory

Protection motivation theory (PMT; Rogers, 1975, 1983) has been used in the literature to better understand people's behaviour online, especially when they have to manage risks. According to the theory, people conduct two appraisal processes when facing a threatening event: one focused on the threat itself and the other on the options they have to diminish it (threat appraisal and coping appraisal, respectively). The result of these appraisals will lead them to do something about the threat or not.

In their threat appraisal, people consider how bad the threat is (perceived severity) and how likely it is (perceived vulnerability). In their coping appraisal, people will assess whether actions are available to remove the threat (response efficacy) and whether they think they can carry these actions out (self-efficacy) (Maddux & Rogers, 1983; Boer & Seydel, 1996).

PMT has been applied to online behaviour in a number of studies (for a good overview see Crossler et al. 2014). This experiment applied insights from PMT to the design of cookie banners. Three PMT-inspired cookie banners were tested:

- A *coping appraisal* banner, which facilitated participants' coping appraisal by highlighting how easy it was for them to manage their personal data in their preferences.
- A *threat appraisal* banner, which sought to heighten participants' perception of a threat by telling them cookies could collect, track and share information such as their IP address, location, and other personal data with third parties.
- A *combined coping + threat appraisal* banner, which combined the elements described above into one cookie banner message.

## 2.4 Social norms

Social norms refer to the influence that other people exert on one's behaviour. The literature distinguishes between injunctive norms (what significant others think an individual ought to do) and descriptive norms (what significant others do themselves). For example, teenagers at a party might consider the injunctive norm is not to drink and drive. But if everybody drinks and drives they will internalise this as the descriptive norm. In other words, they will think 'everybody is doing it' and take that as a cue for their own behaviour.

The use of descriptive norms as a nudge is not new, and has been used for purposes such as getting people to pay their taxes on time and spend less on their electricity bill. They have also been used recently in another study on cookie banners (Coventry et al., 2016). The basic premise lies in informing people about the behaviour of the majority with regard to a particular behaviour. In this experiment, participants were told that 'most other people' knew what cookies were. Presumably, this message would make participants want to learn more about cookies. They would therefore be more likely to click on the link to the cookie policy page.

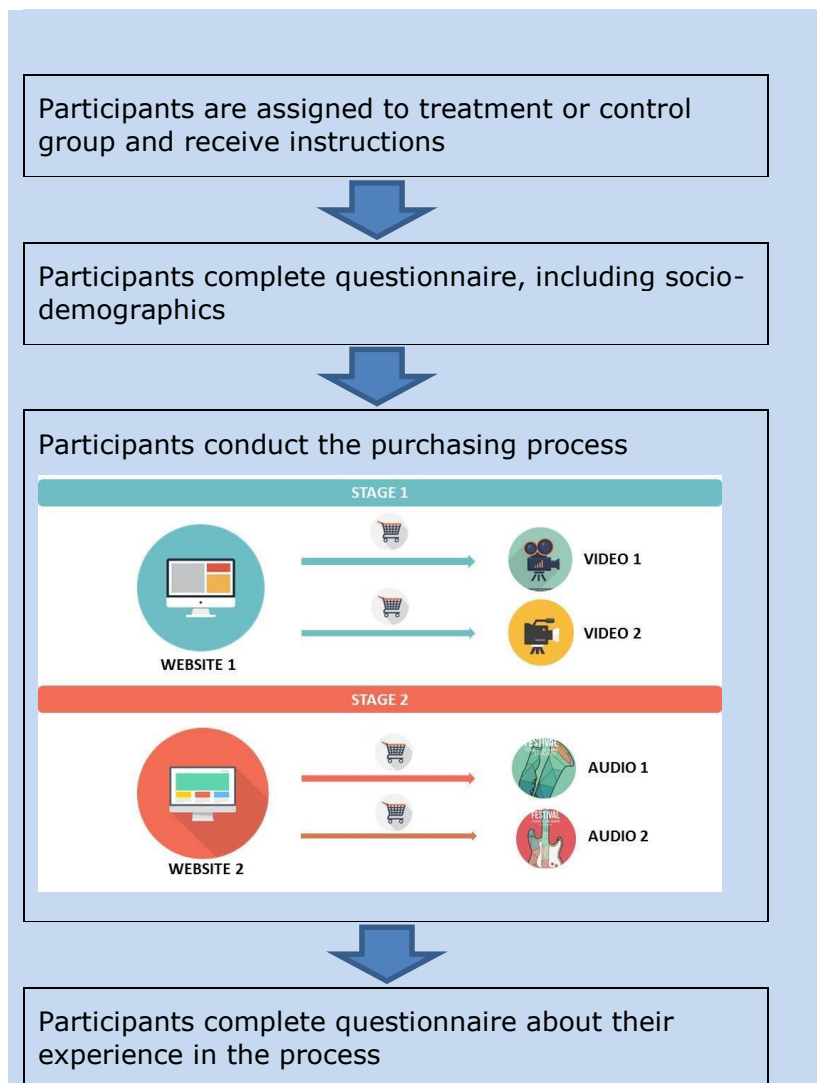


### 3 Methodology

A total of 602 participants took part in the experiment. The sampling sought to keep a balance according to gender and age in each of the treatment and control groups. In the sample as a whole, and in each group, 51% of participants were male (49% female) and 59% were 35 years old or more (41% were less than 35 years old). A full breakdown of the sample as a whole by education, employment situation and income is available from the authors upon request.

The experiment was framed as an e-commerce exercise, where subjects needed to buy music files or videos from two different e-commerce websites. They made two purchases in each website, four in total (see Figure 1). Participants could be penalised for poor cookie control, leading to either inefficient shopping (having to insert their credit card details more than once) or an increased privacy risk (in particular by granting third party access to their cookies).

**Figure 1: The experiment**



Before starting the purchase process, participants received instructions and completed a questionnaire asking for socio-demographic background information. To avoid priming participants, neither the instructions nor the questionnaire made any mention of cookies.

Each time participants entered one of the e-commerce websites for the first time, they were exposed to a cookie banner. The messages included in the cookie banners differed according to experimental treatment. The banner included a link to a page with information on the website's cookie policy and which also allowed participants to change their settings.

In Website 1, third party cookies were allowed by default, but could be un-ticked by the participant. Also by default, cookies were kept for future visits to the store (but the participant could change this). Behavioural measures were collected every time a participant visited a website.

**Figure 2: Excerpt from cookie policy page giving users a choice in managing their settings**

**How to control cookies**

By default , accepting Cookies means accepting all kind of cookies contained in this e-shop but you can manage cookies by checking the following options.

☒ Block third-party advertising cookies

☐ Do not keep data for future visits to this e-shop

Please be aware that you will lose some features and functionality if you choose to reject performance cookies. For example, you won't be able to log in directly in future visits.

Please save changes and your settings will be saved.

You will be redirected to the Cookie banner, where you will have the option to accept or reject the Cookie configuration you saved.

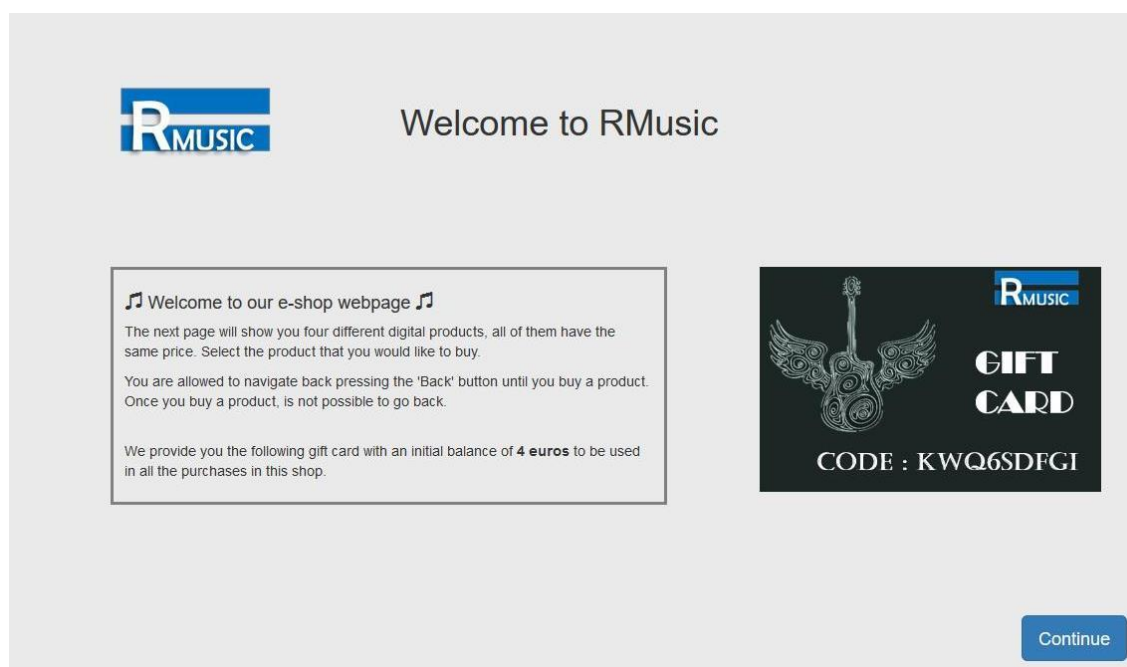
[Save changes](#)

Subjects were asked to buy a video in Website 1. They selected the product and had to sign in. When they finished, they had to leave the store. However, at that point they were asked to return to the store for a second purchase. Once they selected the product for their second purchase, one of the following situations occurred:

- If cookies had not been accepted in the first purchase, they had to sign in again.
- If cookies had been accepted in the first purchase, but the default settings regarding cookies in future visits were changed to 'do not keep', participants had to sign in again.
- If cookies had been accepted in the first purchase, but the default settings regarding cookies in future visits were not changed, participants did not have to sign in again (because username and password had been kept).

The purchase process for Website 2 was the same as for Website 1, with the exception that participants purchased songs instead of videos, and the cookie policy did not allow sharing data with third parties. After taking part in the mock e-commerce exercise, participants completed a questionnaire about their experience in this process.

Figure 3: Screen shot of Website 2 entry page



### 3.1 Incentives

Participants were provided with a fixed show-up fee. In addition, they could obtain a further variable payoff by buying and playing, for two minutes, each of their audio and video purchases. The maximum value of this variable payoff was equal to the price of their four purchases (all were priced the same).

The maximum variable payoff could be reduced depending on the participant's behaviour. This was communicated clearly and simply to participants in the instructions to the experiment, immediately after receiving an initial welcome message. The two ways in which their payoff could be reduced were:

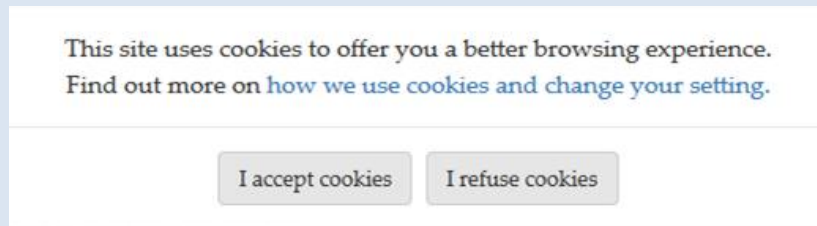
- By increasing their exposure to privacy risk: If participants browsed in a way that facilitated third parties' access to their information, the chances of receiving unwanted ads increased, which in turn reduced the payoff. This meant participants had to be careful not to browse in a website where cookies shared data with third parties. This risk was eliminated if participants either rejected cookies or accepted cookies but disabled the sharing of information with third parties (which was the default option in Website 1, see Figure 2).
- By browsing with suboptimal functionality: If participants had to sign in on their second visit to either Website 1 or Website 2 because the cookie had not stored their data for future visits, the variable payoff was also reduced. To avoid this, participants had to accept cookies and then, in the cookie policy page, had to allow the websites to keep their data for future visits.

### 3.2 Experimental conditions

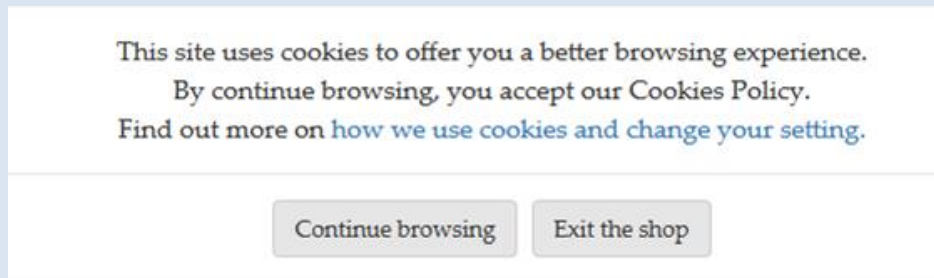
In the control condition for this experiment, the cookie banner presented the standard message as suggested by the European Commission (*traditional EC banner*). In the experimental treatments, the cookie banners incorporated messages based on the behavioural insights presented earlier, as described in Figure 4.

**Figure 4: Seven cookie banners**

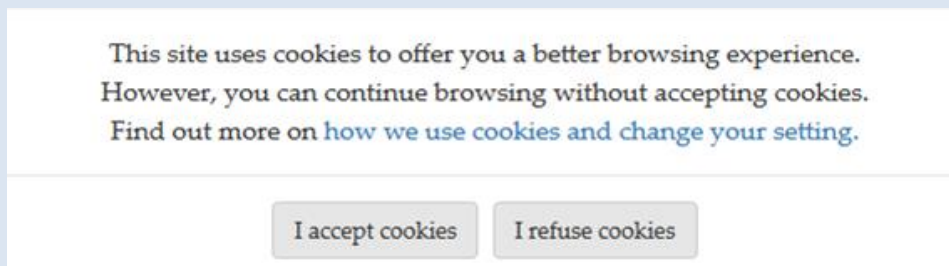
1. Traditional EC. This was the control condition.



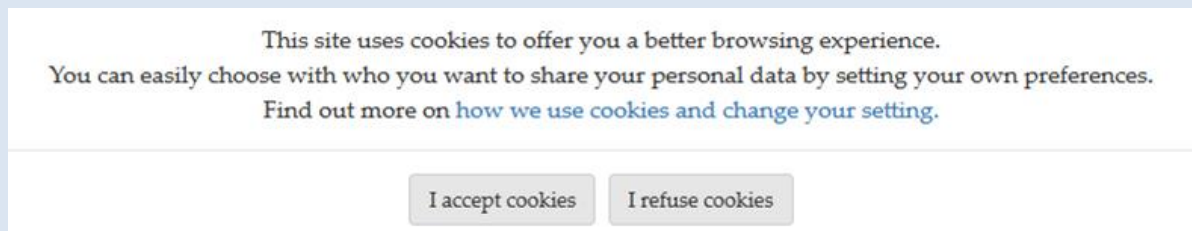
2. Default. By continuing browsing, participants were assumed to accept cookies.



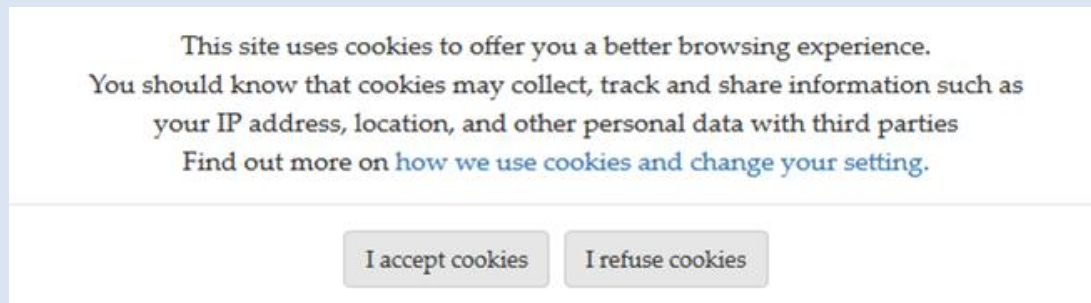
3. Awareness of choice. Users were made aware that they had a choice, and could continue browsing even if they did not accept cookies.



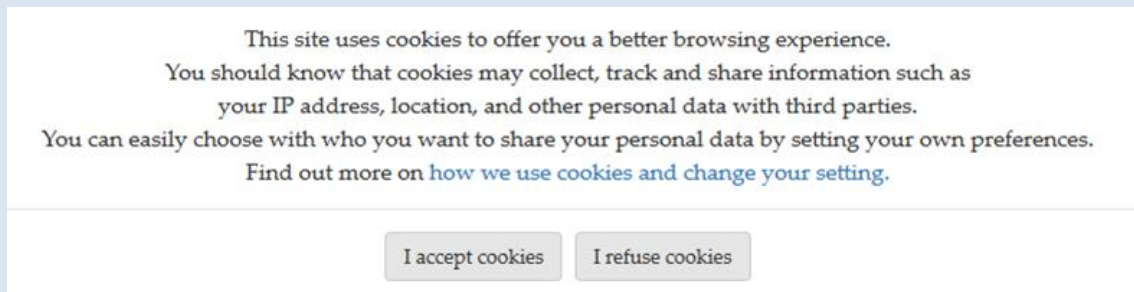
4. Heightened coping appraisal. This condition was based on protection motivation theory (PMT), and sought to heighten self-efficacy and response efficacy, both components of coping appraisals. The cookie banner told participants how they could manage their settings, optimising functionality and minimising risk.



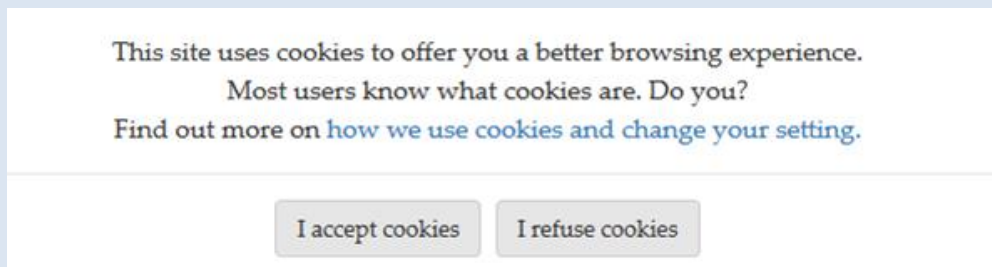
5. Heightened threat appraisal. This condition was also based on PMT. It sought to highlight the threat to privacy posed by cookies sharing information with third parties.



6. Combined coping + threat appraisal. This condition included both elements of the coping appraisal and threat appraisal messages.



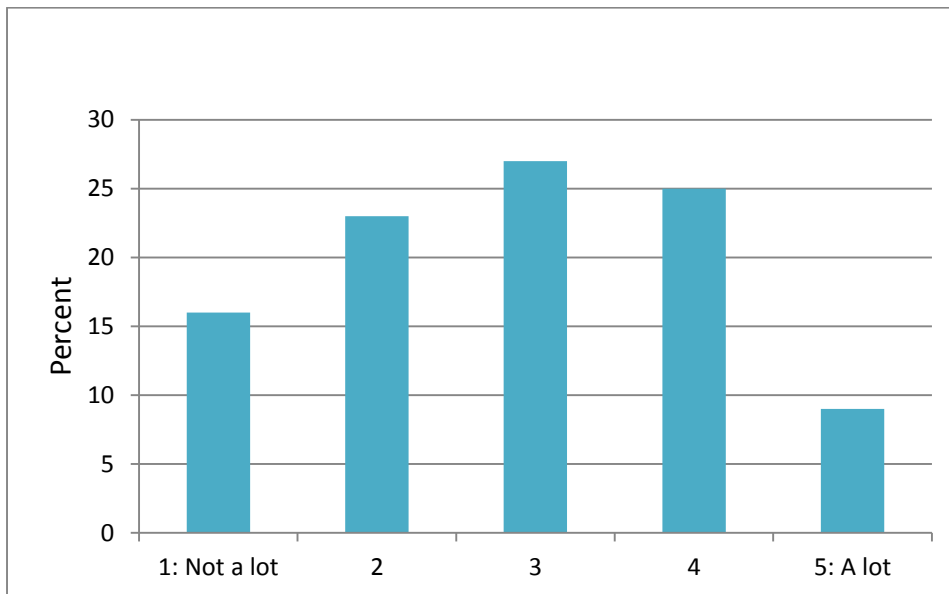
7. Social norms. This condition highlighted the power of social norms by telling participants most other users knew about cookies.



## 4 Results

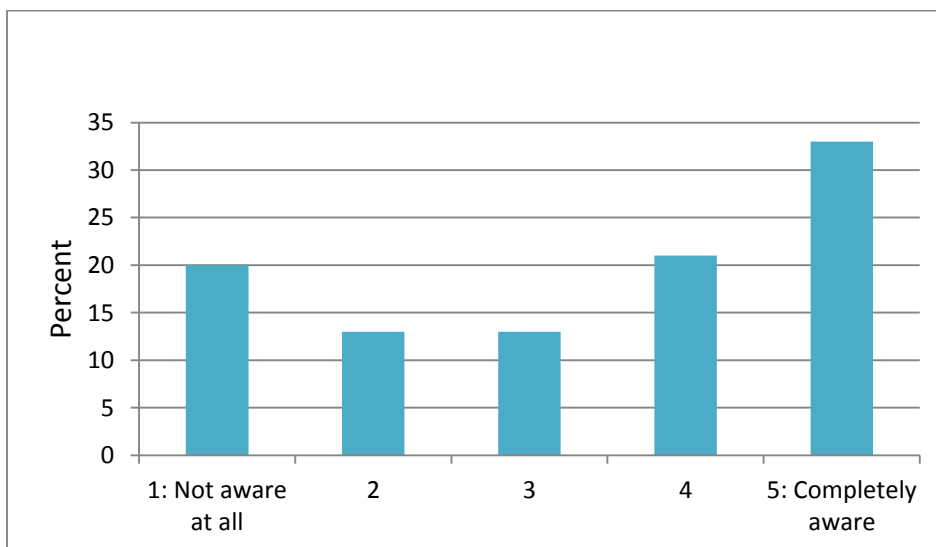
The post-experiment questionnaire asked participants about their knowledge of cookies prior to the experiment. Results show that participants, on the whole, did not consider themselves to be very knowledgeable about cookies (see Figure 5). Over 60% of participants scored 3 or less in 1-to-5 binary adjective items ranging from 'not a lot' to 'a lot'. Less than 10% felt that they knew 'a lot' about cookies.

**Figure 5: Answers to "Prior to this experiment, how much did you know about cookies?"**



However, when asked specifically, over 50% of participants were likely to be aware or completely aware (i.e. scored 4 or 5 in binary adjective scales) that cookies could be used to track people's movement on the Internet. In other words, although they might not consider themselves particularly knowledgeable, this particular aspect of cookies was relatively well known (Figure 6).

**Figure 6: Answers to "Prior to this experiment, how aware were you that cookies could be used to trace movements of people on the internet?"**



With regard to the experiment itself, three behavioural measures were collected:

*(a) Cookie acceptance*

The first measure captured whether participants accepted cookies at least once during the entire shopping experience. On average, 60% of participants accepted cookies.

**Table 1: acceptance of cookies, by experimental treatment**

<b>Treatments</b>	<b>Rejects all cookies</b>	<b>Accepts cookies at least once</b>	<b>Total</b>
<b>Traditional EC (control)</b>	37	49	86
<b>Default</b>	0	86	86
<b>Awareness of choice</b>	37	49	86
<b>Heightened coping appraisal</b>	42	44	86
<b>Heightened threat appraisal</b>	41	45	86
<b>Combined coping + threat appraisal</b>	45	41	86
<b>Social norms</b>	40	46	86
<b>Total</b>	<b>242</b>	<b>360</b>	<b>602</b>

When looking at the results in Table 1, the *default* condition clearly stands out. All participants in this condition accepted cookies. Regarding the other conditions, none was more likely (statistically speaking) than the *traditional EC* banner to make users accept or reject cookies.

*(b) Clicking on the link*

The second measure captured whether participants clicked the link 'how we use cookies and check your settings', which gave access to the cookie policy page. Clicking on the link was necessary to receive the maximum variable incentive, since this page contained information on third party cookies and the functionality enabled by cookies. Were different cookie banners more or less effective than the control group in promoting this behaviour?

Results show that participants in the *combined coping + threat appraisal* condition were significantly less likely to click on the link to the cookie policy page than participants in the control condition ( $p=0.03$ ). The rest of experimental conditions showed no differences with the control group (Table 2).

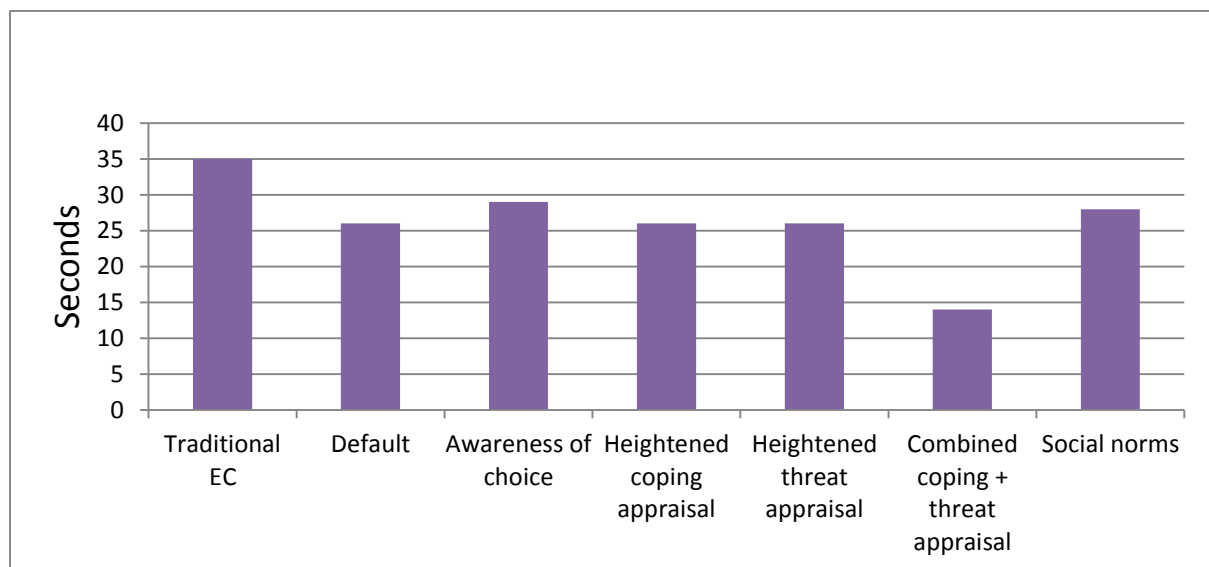
**Table 2: Clicking on the link for more information, by experimental treatment**

Treatments	Did not click on a link at all	Clicked on the link at least once	Total
<b>Traditional EC (control)</b>	59	27	86
<b>Default</b>	64	22	86
<b>Awareness of choice</b>	64	22	86
<b>Heightened coping appraisal</b>	62	24	86
<b>Heightened threat appraisal</b>	64	22	86
<b>Combined coping + threat appraisal</b>	71	15	86
<b>Social norms</b>	61	25	86
<b>Total</b>	<b>242</b>	<b>360</b>	<b>602</b>

*(c) Time spent in cookie policy pages*

The third measure captured the amount of time participants spent on the cookie policy pages of the websites. Results show that participants in the *combined coping + threat appraisal* condition spent the least amount of time on the privacy policy pages, a statistically significant difference with the control group ( $p=0.03$ ). However, this was simply a consequence of them clicking less on the link leading to these pages. The other treatments, however, showed no statistically significant difference in the time spent reading the privacy policy pages compared with the control condition.

**Figure 7: Average time spent by participants on the four cookie policy pages**





## 5 Discussion

The *combined coping + threat appraisal* banner made people less likely to click on the link for more information. Perhaps the message on its own, which contained more information than the others, was sufficient as a warning. Participants therefore had no need to click the link for more information. However, the literature on information overload leads us to believe that people's limited attention span, combined with the length of the message, might have made them pay less attention and ignore the link (Jacoby et al., 1974; Scammon, 1977). Further investigation about the impact of PMT-inspired nudges and the effect of long warning messages is needed to unpack these findings further.

The *default* condition led to almost twice as many cookie acceptances than the other conditions, confirming what the literature on defaults has suggested. Practically all participants who were exposed to this treatment accepted cookies. But did they do so with or without thinking about the consequences? The evidence would indicate without, since those in the *default* condition were no more likely to click on the link for information than those in the *traditional EC* banner.

This study set out to examine different designs for a cookie banner, using the *traditional EC* banner as the control. In so doing, it has provided a comparative assessment of this banner. Would other banners make a difference in cookie acceptance? Only the *default condition* would make a difference, making people more likely to accept cookies. Would other banners make a difference in people's willingness to click for more information and stay longer in the cookie policy page? Only the *combined coping + threat appraisal* banner showed a difference, leading people to click *less* on the link for more information (which, given the conditions of the experiment, represented suboptimal behaviour). Therefore, in this experiment, alternative cookie banners did not work 'better' than the *traditional EC* banner.

Finally, regarding limitations, this study is a 'one-shot' experiment. We do not know what the long-term effects of nudges might be on behaviour, especially given the possible impact of habituation. Other complementary forms of enquiry would be needed to establish whether the effects of nudges are long-lasting or not.

## 6 Policy implications

The main policy implications of this study, based on observed behaviour in a controlled experimental setting, are the following:

- ✓ The existing practice by some service providers of using designs similar to the *default* banner leads to much higher rates of cookie acceptance. However, there is no accompanying increase in willingness to be better informed about cookies. A *default* banner is a very effective nudge by service providers to increase cookie acceptance, but should raise a warning flag to regulators.
- ✓ Increasing the length of a warning message may decrease its effectiveness, given people's limited attention span and the large amount of information they must process online. Further research should follow up on this.
- ✓ There is no evidence that redesigning cookie banners in innovative ways will lead to a more cautious online behaviour. The *default* banner led to more but unreflective cookie banner acceptance, and a *combined coping + threat appraisal* banner made people click less on the link for more information (which was suboptimal in this experiment). In other words, on the basis of this study, we cannot say that the current design of the *traditional EC* banner is inadequate.

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Publications Office

doi:10.2791/22197

ISBN 978-92-79-64432-0